

Appl. No. : 09/779,691
Filed : February 7, 2001

follows the signature page of this Amendment. On this set of pages, the insertions are double underlined while the ~~deletions are struck through~~.

Discussion of Objections to the Drawings

The Examiner has objected to the drawings. The Examiner notes that the drawings are improperly cross hatched. The Examiner also asserts that the cross hatching patterns should be selected from those shown on page 600-81 of the MPEP based on the material of the part.

In reply, Applicant has properly cross hatched all of the parts shown in section in the drawings. Regarding the material of the part, since the 600-81 page of the MPEP says nothing about the drawings, Applicant has assumed that the Examiner has meant page 600-95 of the MPEP (drawing symbols) for the 600-81 page. Applicant has submitted herewith a full set of formal drawings including the above changes.

Discussion of Rejections under 35 U.S.C. § 102(b)

The Examiner has rejected Claim 11 under 35 U.S.C. § 102(b) as being anticipated by Campbell (U.S. Patent No. 6,012,221). Applicant respectfully disagrees with the Examiner in this regard. However, Applicant has canceled Claim 11 in order to expedite the prosecution.

Discussion of Rejections under 35 U.S.C. § 103(a)

The Examiner has rejected Claims 1-10 under 35 U.S.C. § 103(a) as being unpatentable over Bregman (U.S. Patent No. 5,786,986) in view of Abolafia (U.S. Patent No. 3,795,047). However, presently pending claims are patentably distinguished from the prior art as discussed below.

Presently pending Claim 1 recites, among other things, a plurality of integral metal projections made of the same metal material in a single continuous piece as that of the metal core substrate. Presently pending Claim 1 also recites, among other things, that the metal core substrate of said first printed wiring board and the metal core substrate of said second printed wiring board are made of the same metal material with each other.

The Abolafia reference says nothing about the plurality of integral metal projections recited in Claim 1.

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The Bregman reference does not teach or suggest a plurality of integral metal projections made of the same metal material in a single continuous piece as that of the metal core substrate. Bregman at best discloses electrical connectors (42, 42') or conductors (36', 44') (Figure 1). Referring to Figure 1, Bregman clearly shows that the connectors (42, 42') are not in a single continuous piece with the core (12). In addition, referring to column 4, lines 34-45, the conductors (36', 44') of the Bregman reference are electrically connected to the core (12). This confirms that the conductors (36', 44') are not in a single continuous piece with the core (12).

In view of the above, neither Abolafia, Bregman nor the combination thereof discloses a plurality of integral metal projections made of the same metal material in a single continuous piece as that of the metal core substrate recited in Claim 1

Due to the above structural differences, in the claimed invention, the thickness-direction coefficient of linear expansion of the individual printed wiring boards is determined unambiguously by the same metal material used for the both metal projections and metal core substrates, thereby ensuring enhanced mechanical stability against heat at the bonded joints between the boards in the multilayer structure, as exemplified in the specification of this application at page 8, lines 12-16.

Furthermore, each of the printed wiring boards becomes substantially equal in coefficient of linear expansion to each other so that the difference in surface-direction thermal stress among the printed wiring boards in the multilayer structure is reduced extremely with respect to the effect of heat which may affect on the boards during production and assembling processes and/or in the actual use, as discussed in the specification of this application at page 8, lines 1-6.

In view of the above discussion, presently pending Claim 1 would not have been made obvious by either of the Bregman, Abolafia references or the combination thereof. Claims 2-10 depend from base Claim 1 and further define additional technical features. In view of patentability of the base claim and further additional features, the dependent claims are also patentable. Therefore, withdrawal of the rejections is respectfully requested.

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CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is in condition for allowance. If the Examiner has any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the indicated telephone number.

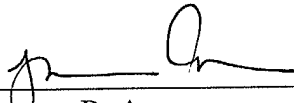
Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: _____

1/21/03

By: _____



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Twice Amended) A multilayer circuit board having a multilayer structure, comprising:
a plurality of printed wiring boards including at least a first printed wiring board and a second printed wiring board, wherein each of said first and second printed wiring boards includes a metal core substrate having a first major surface and a second major surface which are opposite and parallel to each other;

an electrically insulating layer at least partially covering each of the major surfaces;

a conductive printed wiring layer formed on the surface of said electrically insulating layer and including a plurality of wiring lines;

a solder resist layer partially covering the surface of said conductive printed wiring layer;

and

wherein each metal substrate comprises a plurality of integral metal projections made of the same metal material in a single continuous piece as that of the metal core substrate, said projections being of a predetermined height on at least one of said first major surface or said second major surface so as to provide an air gap between the adjacent printed wiring boards in said multilayer structure,

wherein the metal core substrate of said first printed wiring board and the metal core substrate of said second printed wiring board are made of the same metal material with each other; and

wherein said solder resist layer comprises at least one local opening for exposing metal surface at a region corresponding to at least one of said metal projections.

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